CLAIMS

1. An optical modulation apparatus comprising:

bidirectional optical amplifying means for transmitting a continuous wave with a single wavelength bidirectionally, and for providing the single wavelength light with a gain;

optical intensity modulation means for carrying out intensity modulation of the continuous wave whose optical power is amplified by said bidirectional optical amplifying means, by a transmission signal with a mark-to-space ratio of practically 1/2; and

optical regression means for feeding the continuous wave passing through the intensity modulation by said optical intensity modulation means back to said optical intensity modulation means, or back to said bidirectional optical amplifying means directly, wherein

a modulation section loss L (dB), which is defined as a difference between optical power of the input continuous wave to said optical intensity modulation means and optical power of output modulated light from said optical intensity modulation means to a gain G (dB) of said bidirectional optical amplifying means, is set in a range from 0 (dB) to 2G + 3.0 (dB).

2. The optical modulation apparatus as claimed in claim 1, wherein the modulation section loss L (dB) is set at G + 1.5 (dB).

3. The optical modulation apparatus as claimed in claim 1, wherein said bidirectional optical amplifying means is operated in an unsaturated region of the gain.

4. The optical modulation apparatus as claimed in claim 2, wherein said bidirectional optical amplifying means is operated in an unsaturated region of the gain.

5. The optical modulation apparatus as claimed in any one of claims 1-4, wherein said optical intensity modulation means is a reflection type optical intensity modulator having an optical reflector constituting said optical regression means at a rear end of said optical intensity modulation means.

6. The optical modulation apparatus as claimed in any one of claims 1-4, wherein said optical intensity modulation means is a transmission-type optical intensity modulator that is installed in an optical loop constituting said optical regression means formed via an optical circulator.

7. The optical modulation apparatus as claimed in any one of claims 1-4, wherein said optical modulation apparatuses equal in number to multiplexed wavelengths are installed, and further comprise wavelength multi-demultiplexing means for demultiplexing continuous waves which are wavelength division multiplexed, for supplying each single wavelength to one of a plurality of said optical modulation apparatus, and for multiplexing modulated light rays output from said plurality of optical modulation apparatuses to be output.

8. An optical modulation apparatus comprising:

a plurality of sets each of which includes:

bidirectional optical amplifying means for transmitting single wavelength light bidirectionally which constitutes multi-wavelength light including a plurality of optical carriers, and for providing the single wavelength light with a gain;

optical intensity modulation means for modulating the single wavelength light by transmitting the single wavelength light bidirectionally which is provided with the gain by said bidirectional optical amplifying means; and

optical regression means for regressing the single wavelength light transmitting through said optical intensity modulation means to said optical intensity modulation means again, wherein said plurality of sets are provided in correspondence to the plurality of single wavelength light rays constituting the multi-wavelength light;

wavelength multi-demultiplexing means for demultiplexing the multi-wavelength light into single wavelength light rays, for inputting the single wavelength light rays into said bidirectional optical amplifying means, and for multiplexing a plurality of single wavelength light rays output from said bidirectional optical amplifying means again;

a plurality of polarization rotation means each interposed between said bidirectional optical amplifying means and said optical intensity modulation means, for rotating a plane of polarization of each one of the single wavelength light rays; and

polarization demultiplexing means for supplying input multi-wavelength light to said wavelength multi-demultiplexing means,

for separating from the input multi-wavelength light, output multi-wavelength light which has its plane of polarization rotated by said polarization rotation means and is output from said wavelength multi-demultiplexing means, and for outputting the demultiplexed output multi-wavelength light.

9. The optical modulation apparatus as claimed in claim 8, further comprising polarizers interposed before or after said optical intensity modulation means.

10. An optical modulation apparatus comprising:

n semiconductor optical amplifiers for generating population inversion by individual injection currents, where n satisfies n >= 2;

(n + 1) optical connection means for successively connecting an input terminal, said n semiconductor optical amplifiers and an output terminal;

optical isolators successively interposed at even number or odd number positions of said (n + 1) optical connection means; and

optical intensity modulation means for carrying out intensity modulation of a continuous wave.

11. The optical modulation apparatus as claimed in claim 10, wherein one of said n semiconductor optical amplifiers is supplied with the injection current undergoing intensity modulation by a transmission signal, and is made said optical intensity modulation means.

12. The optical modulation apparatus as claimed in claim 10, wherein said optical intensity modulation means is interposed into one of said (n + 1) optical connection means.

13. The optical modulation apparatus as claimed in claim 10, wherein said optical intensity modulation means is interposed into one of said (n + 1) optical connection means except for the optical connection means connected to said input terminal and said output terminal.

14. The optical modulation apparatus as claimed in claim 12 or 13, wherein said optical intensity modulation means is interposed into optical connection means of said (n + 1) optical connection means, which have none of said optical isolators interposed.